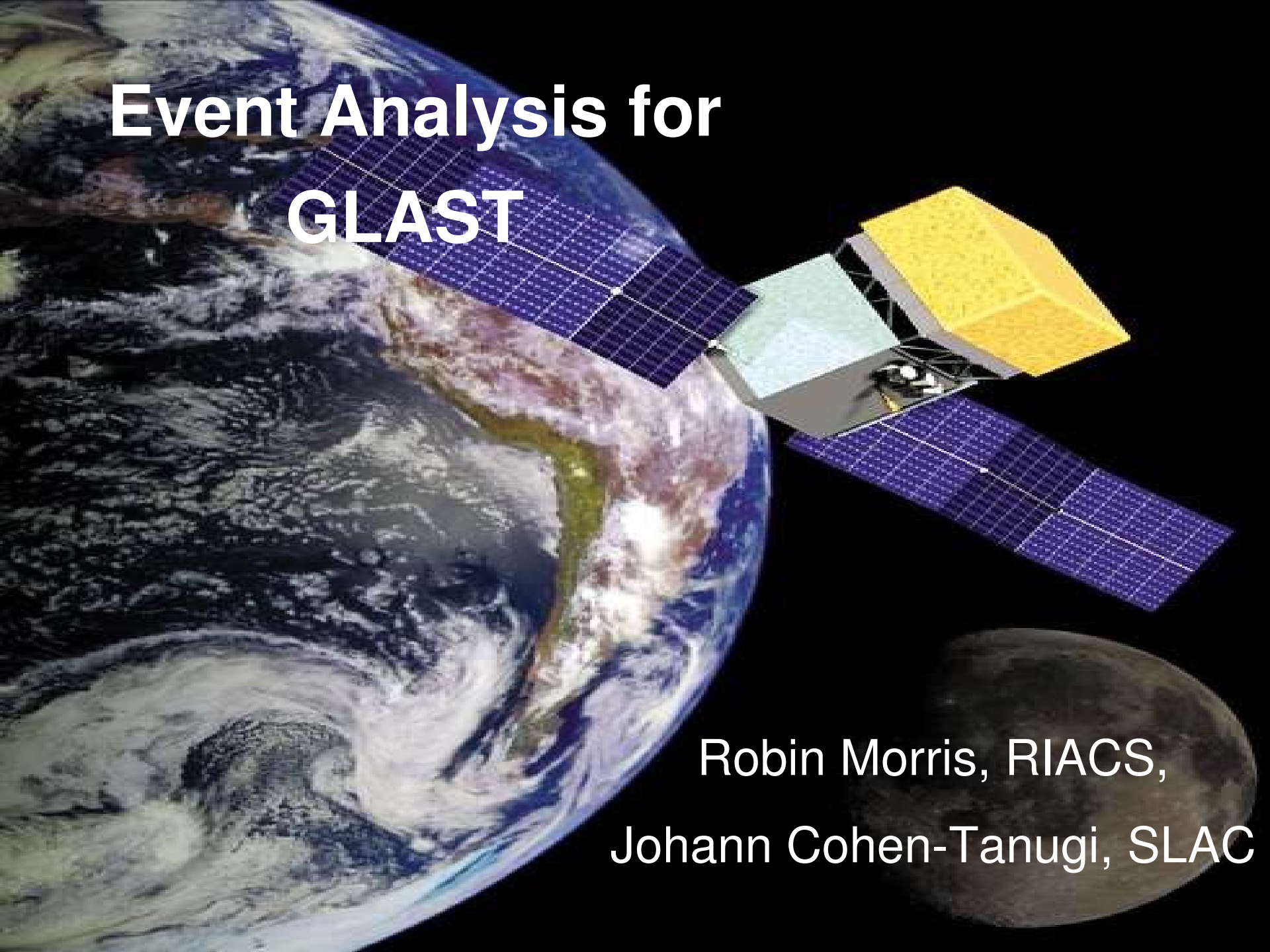


Event Analysis for GLAST



Robin Morris, RIACS,
Johann Cohen-Tanugi, SLAC

Education and Public Outreach

We were successful in applying for an EPO supplement.

We used this to produce a video, which will be aired on PBS in the San Francisco Bay Area, and potentially nationwide (and will also be on YouTube).

[show video]

Credits

Production:

Brett Casadonte, Nelson Singleton

Animation:

Cruz Dewilde

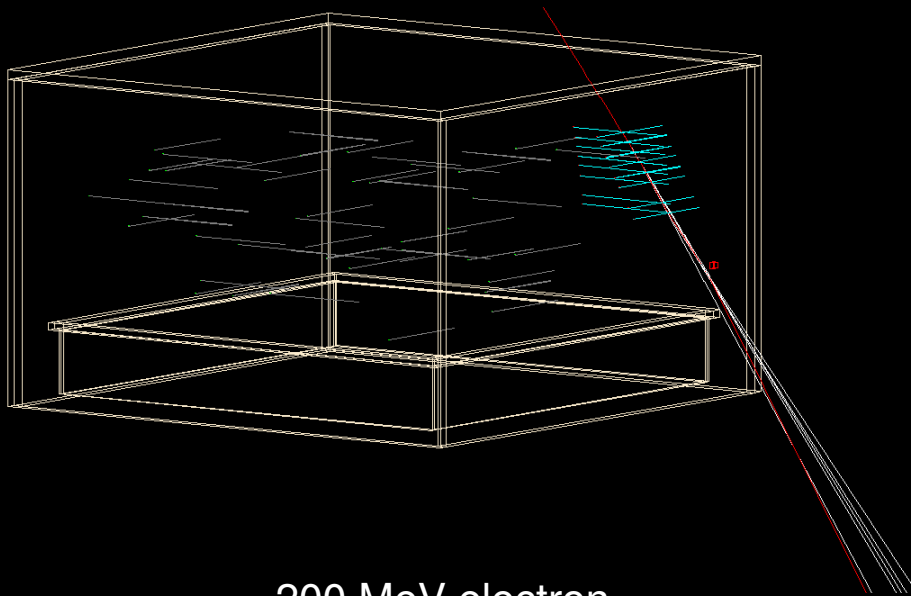
Now back to your regular scheduled programming....

As shown, a gamma-ray event is made up of an electron and a positron

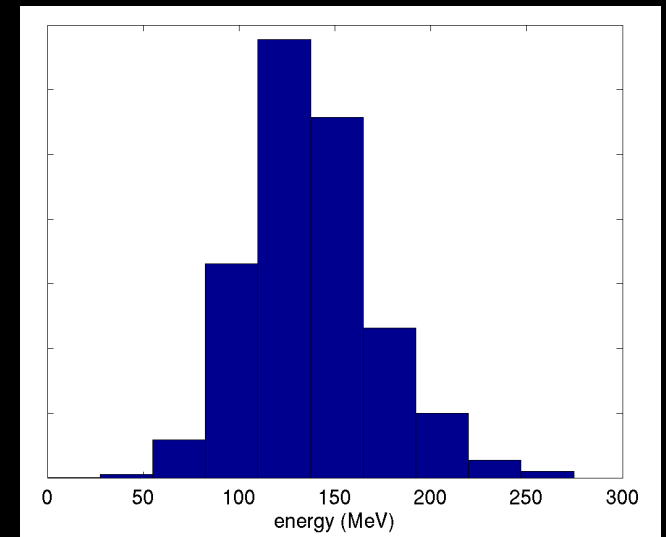
The basic process is the interaction of an electron with the LAT

By careful analysis of the path of the electron (especially the scattering angles as it traverses each tungsten layer), we can estimate the electron's energy

Electron Energy Estimation

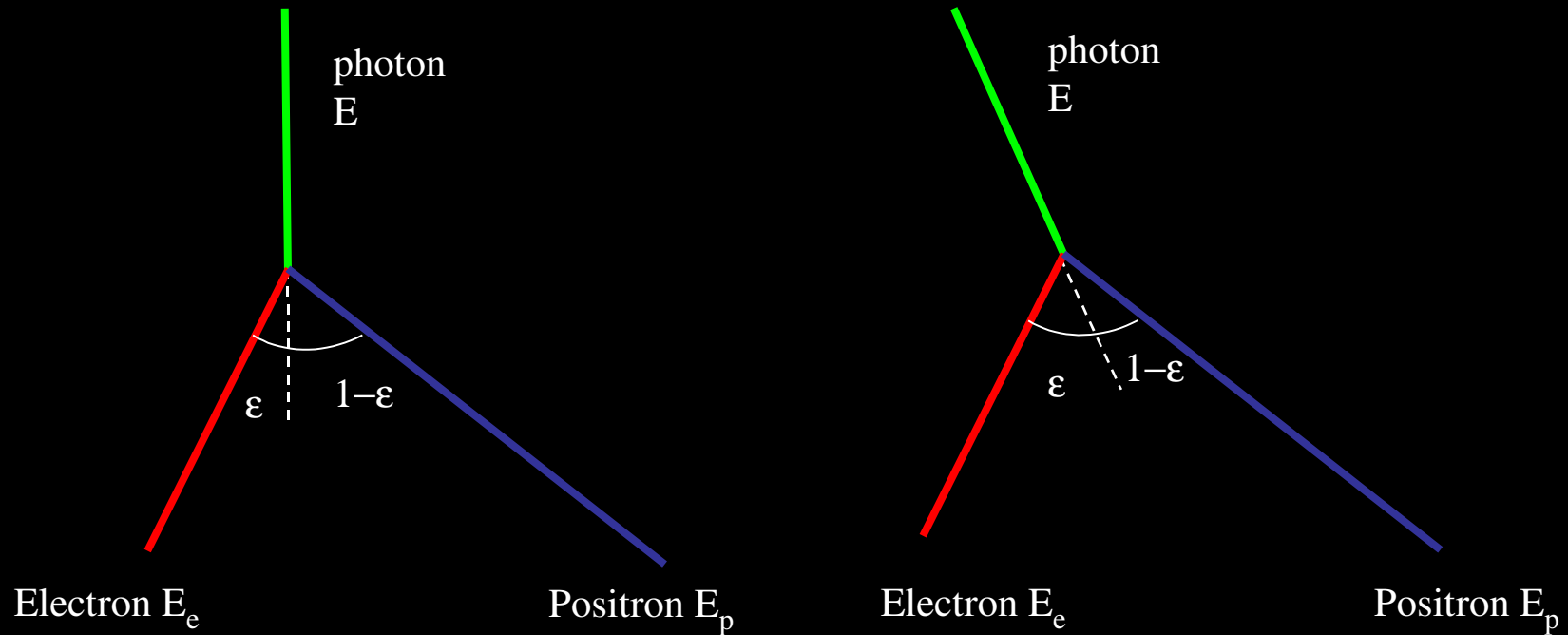


200 MeV electron



event energy

Photon Estimation

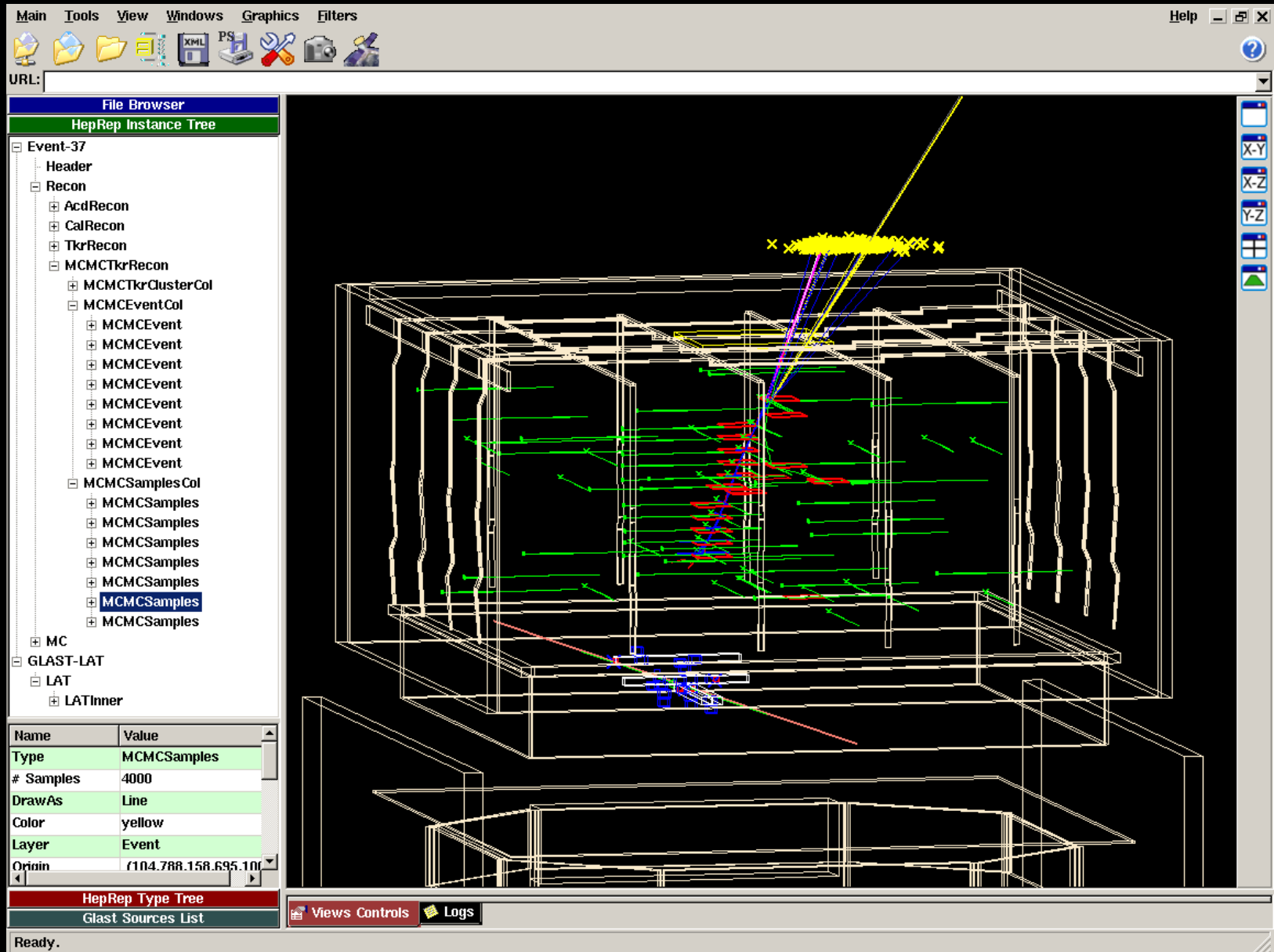


Accurate reconstruction of the direction of the photon depends on accurate estimation of the energies of the electron and the positron

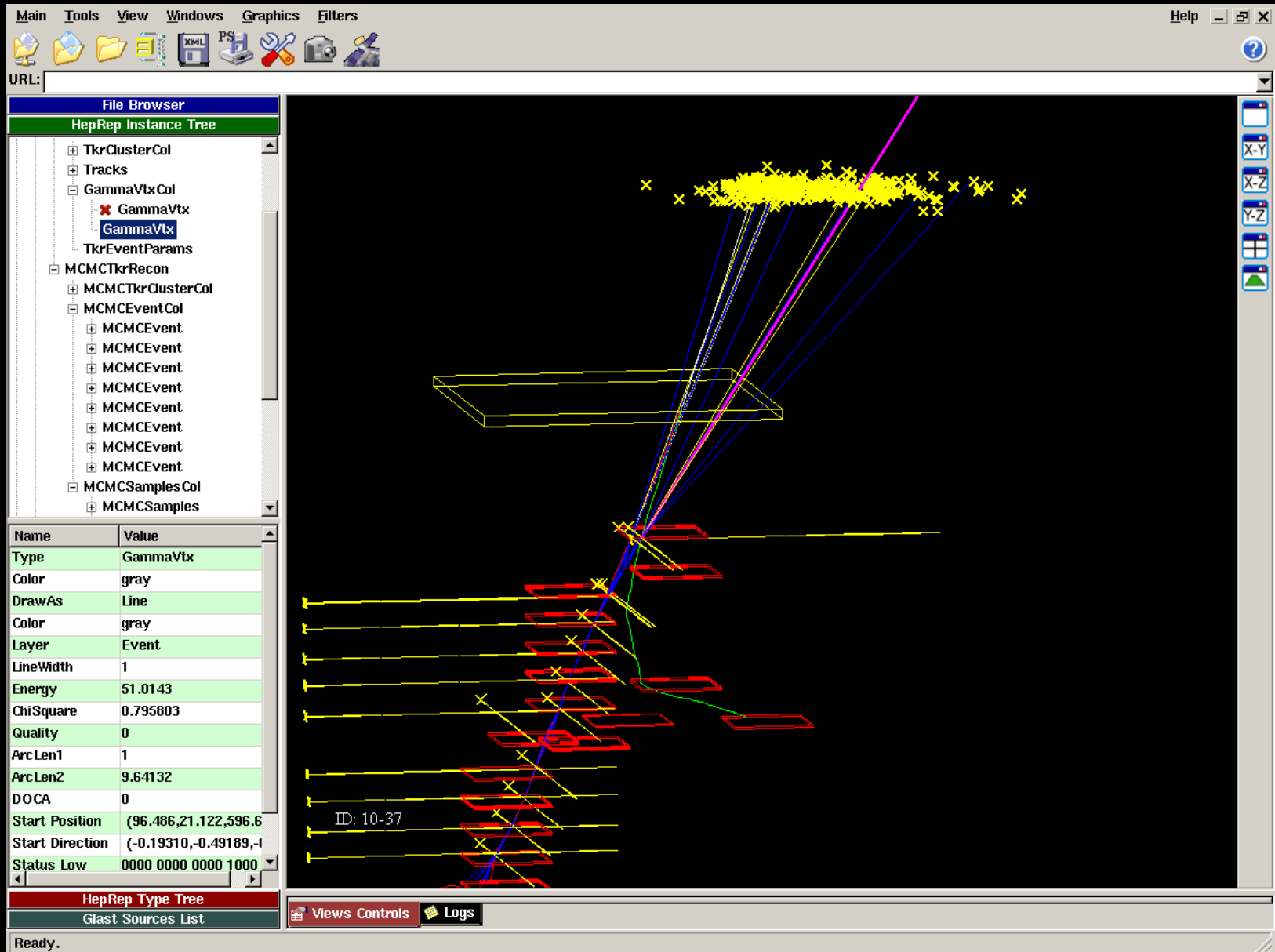
Analysing Photon Events

1. **Reject** clusters that are not paired, or that are a long way from the event
2. Form **hypotheses** by allocating cluster intersections to the tracks of the electron and the positron
3. Form **events** from the hypotheses that define the geometry and the energy of the photon and the e^-/e^+
4. Run an **MCMC** algorithm on the events to estimate the distribution of the parameters (energy/directions etc)

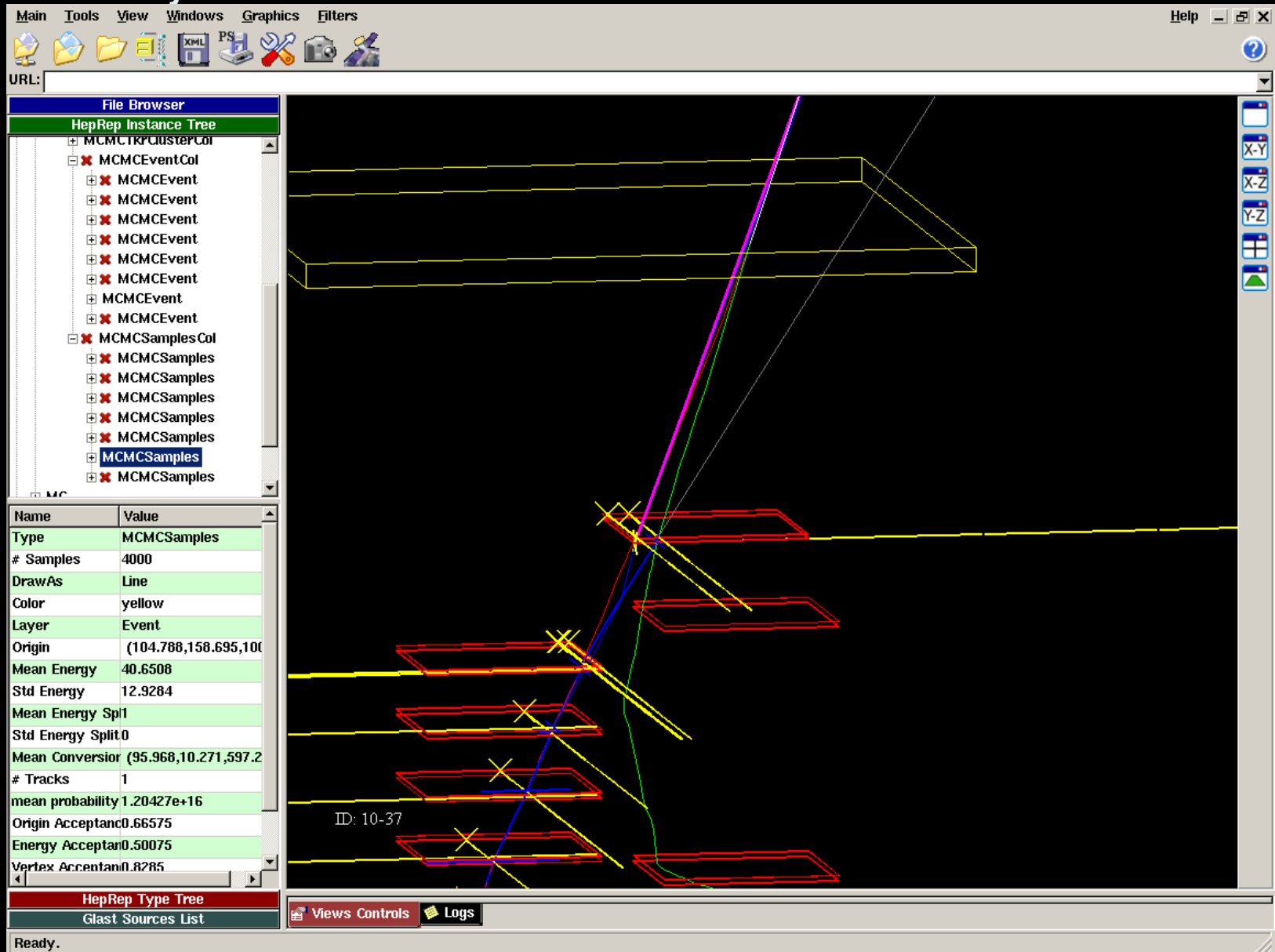
100 MeV Photon



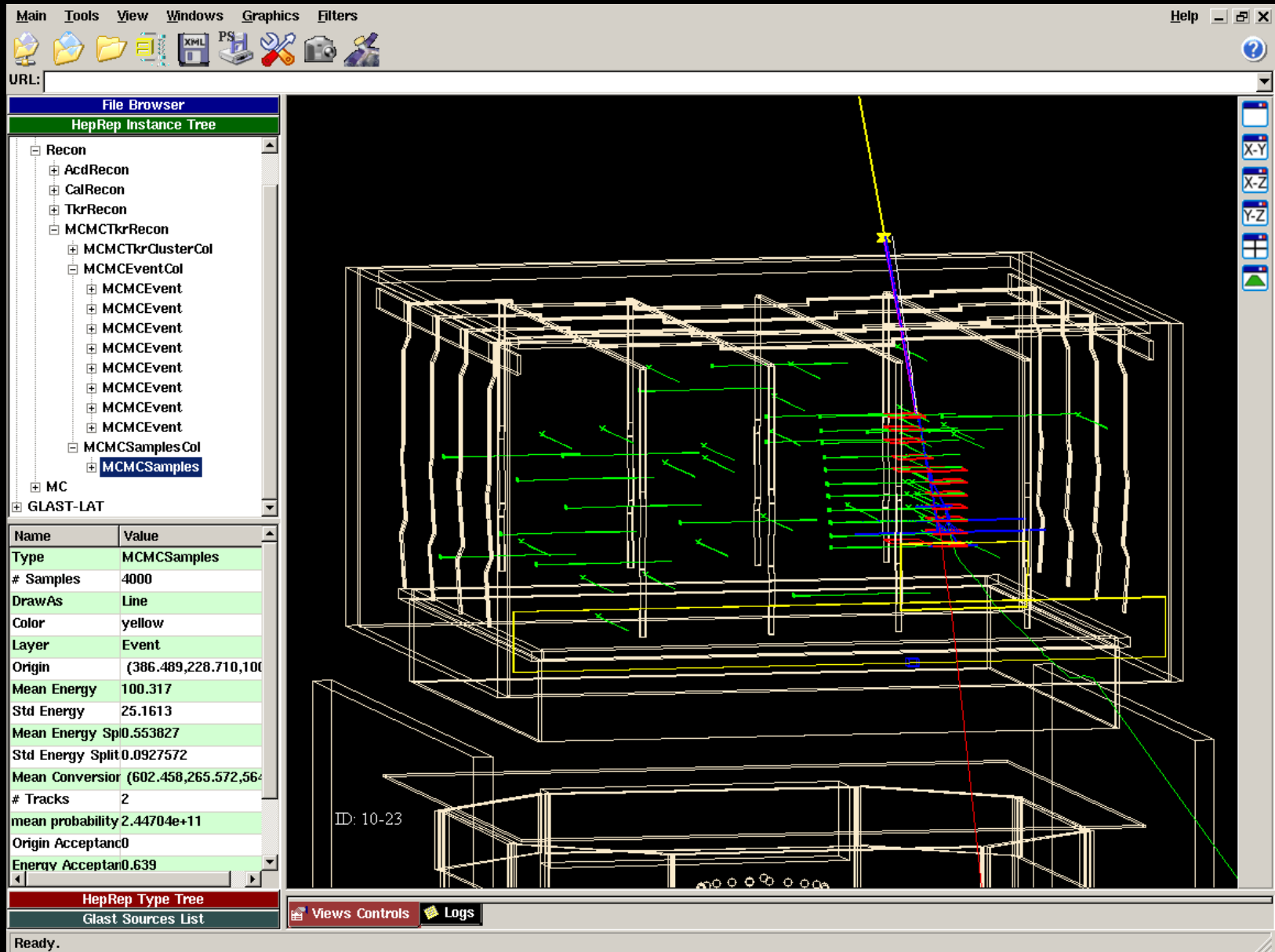
100 MeV Photon – note the multiple hypotheses (blue) due to the structure of the event at the top layer



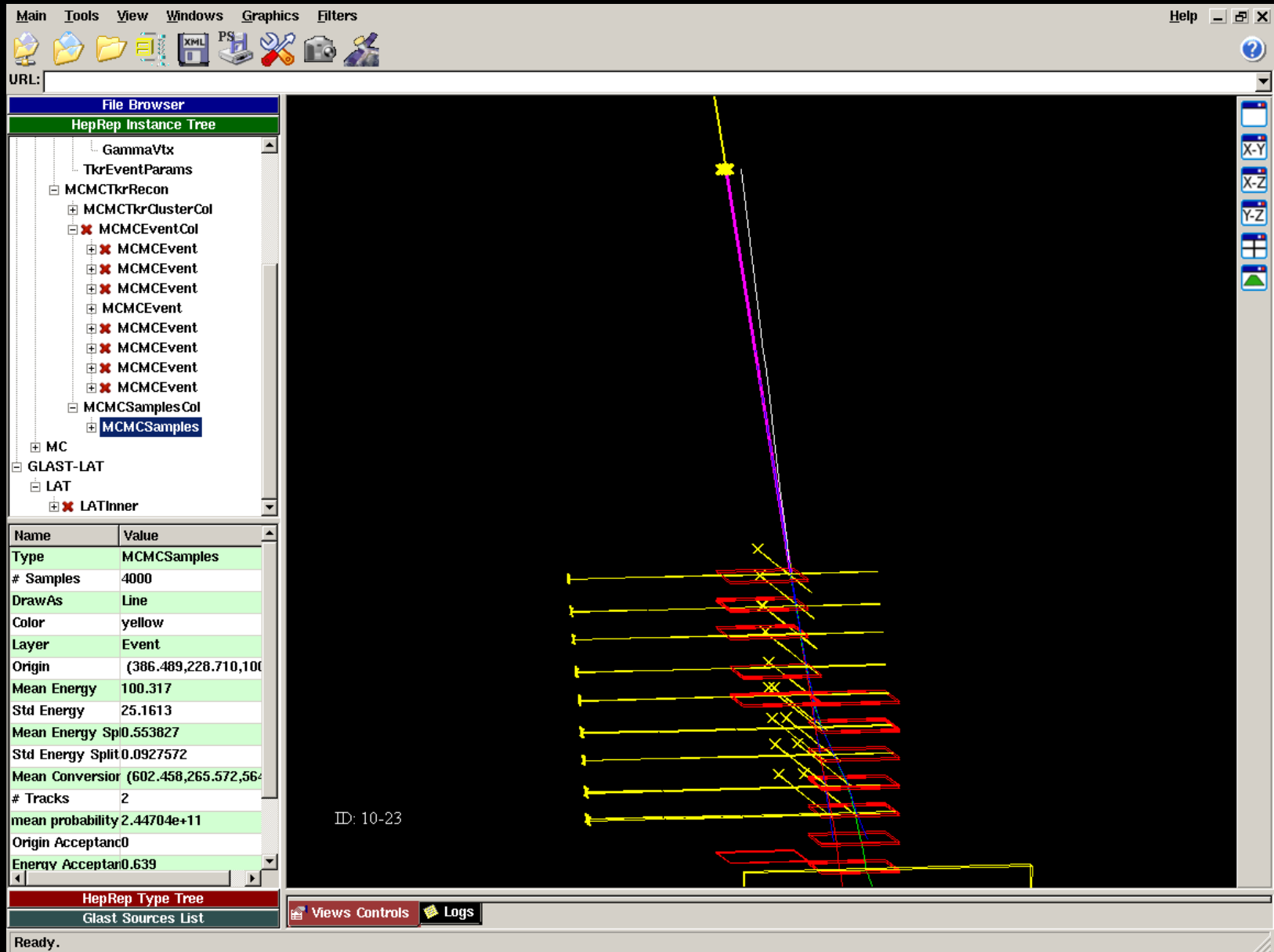
100 MeV Photon – the hypothesis with the highest probability correctly determines the direction of the photon; the grey line indicates the direction estimated by the standard reconstruction



200 MeV Photon



200 MeV Photon



Highlights

- Presentation/paper in Statistical Challenges in Modern Astronomy IV
- Presentation/paper at the First Glast Symposium
- Talks at Cambridge University (UK), University of California, Santa Cruz
- Inclusion of this technology in the POET and GEMS small explorer (smex) proposals

Work in Progress

Improved hypothesis generation when one track passes between towers at some layers

Estimation of the relative probabilities of the events using importance sampling

Evaluation of the gamma-reconstruction code against the standard reconstruction